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Results Obtained from Public Clinics Held to Demonstrate Fuel Economy Maintenance

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ABSTRACT

The results from two week-long clinics held to demonstrate how drivers could improve their fuel economy through proper car maintenance showed that:

- Three out of four cars had tires that were underinflated by 35 kPa (5 psi) or more when tire manufacturer's cold sidewall pressure ratings were used as a standard. Twenty-eight percent of these tires were underinflated by 69-97 kPa (10-14 psi)with 6% underinflated by 103 kPa (15 psi) or more. These results suggest the average driver can save approximately 4% of the fuel bill by proper inflation.
- Carbon Monoxide (CO) emission levels of 35% of the cars indicated that some form of carburetor adjustment was necessary to increase fuel efficiency while 17% had higher than normal Hydrocarbon (HC) emissions.
- 9% of the air filters required replacement.
- 14% of Postive Crankcase Ventilation (PCV) valves, filters or hoses required replacement.
- 99.7% of surveyed drivers reported that they were "very satisfied" or "satisfied" with the clinics.

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1/ SUMMARY REPORT: TORONTO/KITCHENER

1.1/ DriveSave: Demonstration Inspection Maintenance Program

Previous research has shown that significant fuel savings can be obtained through a small number of low-cost maintenance items. In a study conducted at MTC for the Transportation Energy Management Program (TEMP) fuel economy improved an average of 4.2% when adjustments were made on idle mixture, idle speed and ignition timing to a number of cars which were representative of the cars found in Ontario. A separate Federal study found that over 60% of the cars in Canada had at least one tire that was 28 kPa (4 psi) or more under automobile manufacturer's recommended pressures. Since automobile manufacturers' recommended pressures are approximately 28 kPa (4 psi) below tire manufacturers' sidewall pressure ratings, this indicates that the average Ontario motorist can save 3 to 4% of fuel costs by inflating tires to the maximum cold sidewall pressure recommended by tire manufacturers and by maintaining this pressure through regular checkups.

As a result, to make the public more aware of what should be monitored on their cars to obtain maximum fuel efficiency, a demonstration clinic was held by TEMP in cooperation with the OML at Sherway Gardens Mall in Toronto and at Fairview Mall in Kitchener.

The demonstration highlighted a few simple maintenance items that are important for fuel economy and that could be diagnosed in a relatively short period of time. Vehicles were given an emissions check at the tailpipe for CO and HC to determine whether partially burnt or unburnt fuel was being emitted from the exhaust system. The air filter and PCV were checked (dirty air filters and clogged pollution control systems interfere with the efficiency of the engine) and tire pressures were taken (inflating to the maximum cold sidewall pressure decreases rolling resistance and therefore increases fuel efficiency). Each driver was then given a summary sheet of test results along with an explanation of what the results meant as well as, where possible, approximately how much fuel could be saved by making adjustments where necessary.

1.2/ Results

1.2.1/ Public Response

a) Turnout and Literature Distribution

In total, 1389 cars were checked at the two clinics and 1400 DriveSave folders containing information on fuel-efficient driving and driver practices were distributed. An additional 3000 to 4000 pamphlets were picked up by the public at an indoor display. Public interest was high with both the OML and MTC receiving calls about the TEMP clinics.

b) Driver Survey

Four hundred survey sheets were handed out on three consecutive days of the clinic. Drivers were asked if they could spare a moment to fill them out after they had obtained the test results. A survey box was provided outside the maintenance area for completed forms.

Of the 400 surveys, 325 (81%) were returned. Three hundred and twenty-four (324) drivers or 99.7% of the returned sample survey stated that they were either "very satisfied" or "satisfied" with the clinic. In addition, 22% of this sample wrote appreciative comments on their survey sheets. Comments included statements that the clinic had been worth it, was a good idea, that it made people more aware, that the staff were courteous and efficient. Another 4% of the drivers requested more service bays while 14% wrote that they were satisfied but felt the wait had been too long. One person wrote that he was somewhat dissatisfied and would definitely not come again indicating a complete test of the motor had been expected.

1.2.2/ Fuel Economy Check-Up

a) Tire Pressures

Of the 1389 cars 1049 or 76% had tires that were underinflated by 35 kPa (5 psi) or more when tire manufacturer's sidewall pressure ratings were used as a standard. Of these, 42% had tires that were underinflated by 35-62 kPa (5-9 psi), 28% were underinflated by 69-97 kPa (10-14 psi) and 6% were underinflated by 103 kPa (15 psi) or more. Tire pressure results are depicted in Table 1.

Studies have shown that fuel economy decreases by 1% for every 14 kPa (2 psi) of underinflation from maximum sidewall tire pressures. This suggests that 42% of drivers waste from 2.5% to 4.5% of their fuel bill while 33% waste 5% or more. However, such serious underinflation in the latter group not only wastes fuel but is dangerous in that it increases the risk of tire wear and blowout. Overall, based on clinic results, the average fuel loss due to tire underinflation is approximately 4%.

b) Emissions

Of the cars tested, 466 or 35% had CO emissions (indicating partially burnt fuel leaving the exhaust system) that were 1% or more over the most fuel-efficient levels. Of this number, 21% were 3% or more over these levels. As an average rule of thumb, drivers waste 1% of their fuel bill for every CO percentage point above the optimum setting. Therefore, approximately 21% of the drivers currently on the road are wasting at least 3% of their fuel bill through carburetor maladjustments and another 14% are wasting somewhere between 1% and 3%.

Seventeen percent of the cars had HC emissions (indicating unburnt fuel leaving the exhaust system) that were 200 ppm or more above normal levels. However, the CO and HC group were not always mutually exclusive and in many cases the mechanic suggested that a carburetor adjustment could bring both CO and HC levels down. Failing that, a check of the ignition system was indicated. There is no specific equation to gauge the proportion of the total gas bill that is wasted as a result of high HC emissions at this time. Results from the emissions test are depicted in Table 2.

c) Air Filters and PCV

Air Filter and PCV results are depicted in Table 2. Of the cars tested, 131 or 9% required new air filters while 14% required new PCVs, PCV filters and/or hoses. Since dirty air filters and clogged or malfunctioning PCV systems interfere with the efficiency of the engine, it appears that both air filters and PCV systems need periodic inspection to ensure fuel efficiency.

1.3/ Summary of Results and Discussion

- Results from the survey indicated the demonstration clinic was very well received with 99.7% of the respondents being satisfied.

- Three out of four of the cars tested (76%), had tires that were underinflated by 35 kPa (5 psi)or more when tire manufacturer's maximum sidewall pressures were used as a standard. Of these, 33% were underinflated by 69 kPa (10 psi)or more. Therefore, a great many motorists seem to be driving under hazardous conditions as well as losing at least 5% or more in fuel efficiency. The maintenance demonstration specifically tried to acquaint drivers with the dangers of underinflation as well as the fuel loss that occurs as a result of underinflated tires.

  The data show that over 40% of drivers can save from 2.5% to 4.5% on their fuel bill by properly inflated tires, while 32% can save 5% or more. The overall results from the clinics suggest that an average fuel saving of approximately 4% can be obtained from proper tire inflation. More importantly, advocating proper inflation should not only improve fuel economy but increase safety as well.

- The CO emissions of 35% of the cars indicated that some form of carburetor adjustment was necessary to increase fuel efficiency.

  The data show that at least 21% of drivers are wasting approximately 3% or more of their fuel through carburetor maladjustments and another 14% are wasting between 1% and 3%. Additionally, 17% had HC emissions which indicated the presence of more than normal amounts of unburnt fuel leaving the exhaust system. At present there is no equation to specify the proportion of the total gas bill that is wasted as a result of these HC emissions.

- Nine percent of the cars required new air filters and 14% required some repair or replacement in the PCV system. Again, there are at present no indications of what fuel loss is incurred, if any, by dirty air filters and/or malfunctioning PCV systems. However, since dirty air filters and clogged PCV systems interfere with the efficiency of the engine it appears that some fuel loss may occur.

In summary, the maintenance demonstration was very well received by the public. Additionally, data gathered on the site indicate that improved knowledge of, and attention to, car maintenance can save fuel for a majority of present day motorists.

TABLE 1/ Tire Pressure Results From Maintenance Demonstration Clinics

Amount of Underinflation from Sidewall Pressure Ratings	Vehicles
35 - 62 kPa (5 - 9 psi)	42%
69 - 97 kPa (10 - 14 psi)	28%
103+ kPa (15+ psi)	6%

TABLE 2/ CO, HC, PCV and Air Filter Results From Maintenance Demonstration Clinics

CO		HC	PCV	AIR FILTERS
Cars having emissions over optimum levels		Cars having emissions over optimum levels	Cars having malfunctioning PCV valves, filters and/or hoses	Cars having dirty air filters
1 - 3%	3% +			
0.14	0.21	17%	14%	9%